

Trends in International, Federal, and Local Marine Emission Regulations

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Marine Transportation System: Major Themes

- Overarching trend: globalization and integration of transportation systems
- Modernization and expansion
- Multiple constraints and policy issues
 - ship air pollution only newest issue for industry
- Industry and government (MARAD) have central role to promote U.S. fleet potential
 - U.S. opportunity to be proactive, not left behind

Maritime Transportation is about global and regional mobility

- Provides unique service among transportation modes
- Can be leader in freight transportation
- One of the last unregulated modes for air pollution
- Aging U.S. fleet will need to modernize
 - U.S. cargo fleet average age = world fleet scrapping age
 - Ferries may modernize faster to increase regional transit

Ferries poised for dramatic growth

- World cargo fleet growth (average annual): 1.3%
- Container fleet growth (projected annual): 4-10%
- U.S. fleet historic annual replacement rate: <0.5%

- SF Bay Area ferry fleet growth (BAC projections):
 - ~50% annually over the next 20 years*
 - Currently ~12 ferries
 - Phase I growth: 75 ferries by 2010
 - Phase II growth: up to 125 ferries by 2020

Regulatory Trends:

- International standards (adopted but not yet ratified) sent a *clear regulatory signal* for new engine standards
- National and multinational regional air quality will continue to impose *more stringent standards*
 - U.S. EPA regulations, Baltic and North Sea Special Area designation, Sweden's Market-based Approach
- *State and local requirements* to meet clean air standards will continue to focus regulatory action
 - address existing engines through retrofit standards, emissions trading incentives, and operational requirements

Federal and Multinational Efforts

Harmonize International Standards with Specific Local Air Quality Impacts

- State Implementation Plans (SIPs) and regional air quality issues look for maritime reductions
- National Inventory, improving detail and accuracy of regional and local inventories
- Uncertainties are being reduced, picture becoming clearer
 - Inventories becoming more accurate (lower in TX)
 - Monitoring protocols under development (USCG, CMU/UDel, MARAD)
 - Impacts modeling becoming more focused (Ozone, Regional haze, etc.)

Marine emission standards and comparisons (g/kw-hr)

Name		Start	HC	NO _x	CO	PM
MARPOL Annex VI*	< 130 rpm	2000	--	17.0	--	--
	130 – 2000 rpm		--	17.0 – 9.8	--	--
	> 2000 rpm		--	9.8	--	--
EPA Locomotive	Tier 0	2000-01	1.3	12.7	6.7	0.80
	Tier 1	2002-04	0.7	9.9	2.9	0.60
	Tier 2	2005	0.4	7.4	2.0	0.27
			HC+NO_x		CO	PM
EPA on-road diesel engines	MD	2002	2.5			0.10
	HD	2002	2.0			0.10
EPA Non-Road	Tier 1	2000	1.3 (HC) 9.2 (NO _x)		11.4	0.54
	Tier 2	2001-06	6.4 – 6.6		3.5	0.20
	Tier 3	2008-10	4.0		3.5	0.20
EPA Marine Diesel**	Tier 1	2000		(MARPOL)		
	Tier 2	2004-06	7.2		2.0 – 3.5	0.20 – 0.30
	Tier 3	2008-10	4.0 – 5.0		2.0 – 3.5	0.20 – 0.30

* MARPOL is the main international maritime treaty addressing air pollution from ships. When ratified, Annex VI will apply to all marine engines built after 2000.

** (40 CFR Parts 89, 92, and 94, *Federal Register* 68508, December 11, 1998 (EPA,1999)).



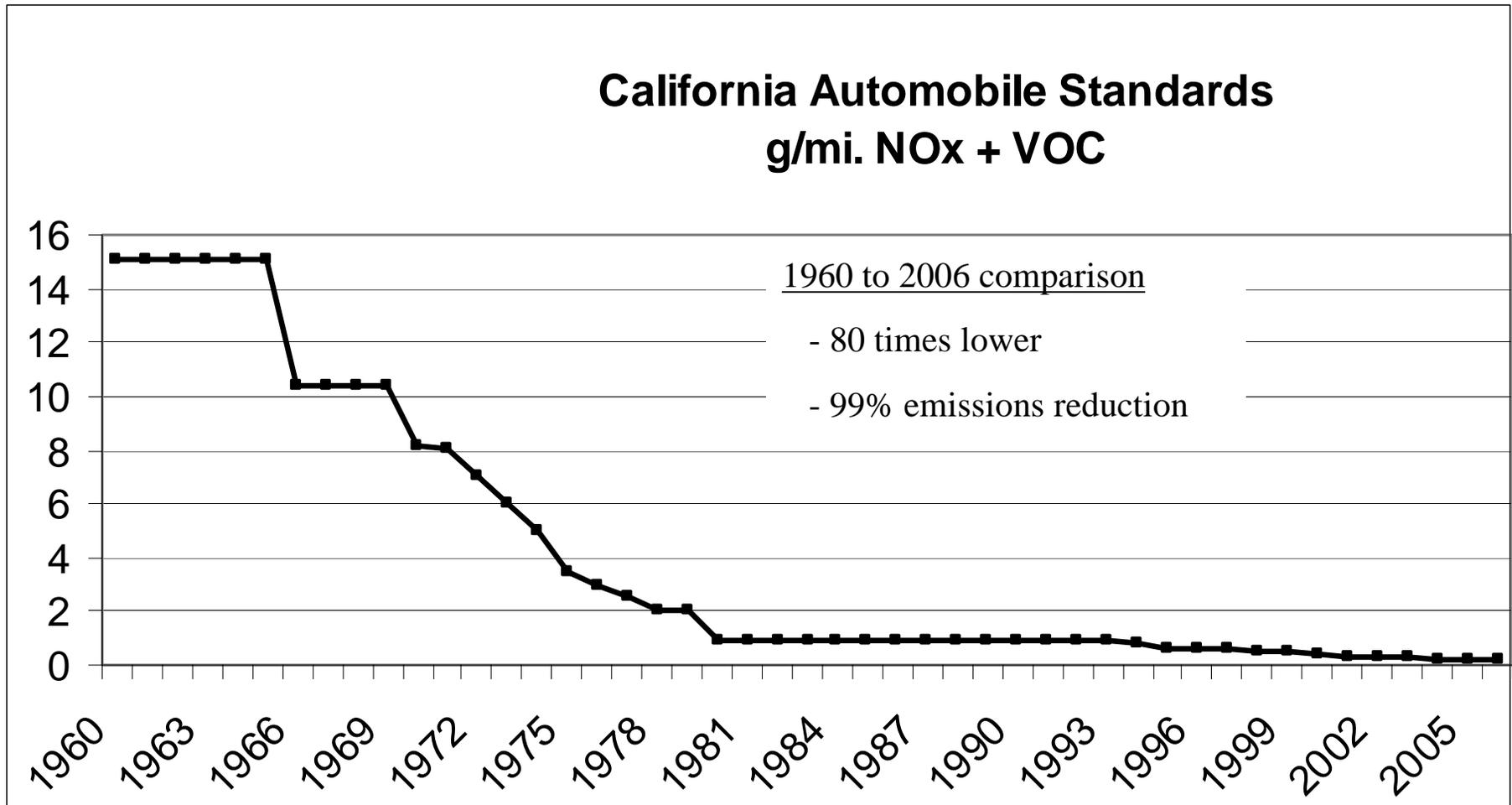
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Ferries caught in the middle? Or caught in the lead?

- Not the largest source in a given region, but must be part of SIP air quality efforts
- Great potential to help increase regional mobility, mitigate congestion problems
- New paradigm: ferries now compared with autos
- Regulated like other ships, ferries cannot compete with cars on a per passenger basis

Ferries: the “lead dog” for clean marine demonstrations

Automobile Emissions reduced by 99% over 35 years



Opportunities to Reduce Emissions

- Short-term: Operational measures, limited potential
 - IMO study showed potential for slower speeds to reduce emissions
- Near-term: After-treatment retrofits, cleaner diesels
 - This is being done in Europe, demonstration projects in U.S.
- Long-term: Alternative fuels for diesels, advanced engine technologies, alternative propulsion
 - Ferries responding to new standards, modernization, expansion

Bottom line

Modernization and expansion with new constraints

- not simply address regulatory process
- more than new engine compliance
- Ferries are in a unique position to lead industry
- A true OneDOT issue: FHWA, FTA, and MARAD
- Industry has opportunity to fill a proactive role

Ferries must focus on the long-term